KEITHLEY

Model 854x Laser Diode Mount

Quick Start Guide

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WARRANTY

Keithley Instruments, Inc. warrants this product to be free from defects in material and workmanship for a period of 1 year from date of shipment.

Keithley Instruments, Inc. warrants the following items for 90 days from the date of shipment: probes, cables, rechargeable batteries, diskettes, and documentation.

During the warranty period, we will, at our option, either repair or replace any product that proves to be defective.

To exercise this warranty, write or call your local Keithley representative, or contact Keithley headquarters in Cleveland, Ohio. You will be given prompt assistance and return instructions. Send the product, transportation prepaid, to the indicated service facility. Repairs will be made and the product returned, transportation prepaid. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days.

LIMITATION OF WARRANTY

This warranty does not apply to defects resulting from product modification without Keithley's express written consent, or misuse of any product or part. This warranty also does not apply to fuses, software, non-rechargeable batteries, damage from battery leakage, or problems arising from normal wear or failure to follow instructions.

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10/02

Model 854x Laser Diode Mount
Quick Start Guide

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The print history shown below lists the printing dates of all Revisions and Addenda created for this manual. The Revision Level letter increases alphabetically as the manual undergoes subsequent updates. Addenda, which are released between Revisions, contain important change information that the user should incorporate immediately into the manual. Addenda are numbered sequentially. When a new Revision is created, all Addenda associated with the previous Revision of the manual are incorporated into the new Revision of the manual. Each new Revision includes a revised copy of this print history page.

Revision A (Document Number 854x-903-01) ..... August 2002

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Safety Precautions

The following safety precautions should be observed before using this product and any associated instrumentation. Although some instruments and accessories would normally be used with non-hazardous voltages, there are situations where hazardous conditions may be present.

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read and follow all installation, operation, and maintenance information carefully before using the product. Refer to the manual for complete product specifications.

If the product is used in a manner not specified, the protection provided by the product may be impaired.

The types of product users are:

Responsible body is the individual or group responsible for the use and maintenance of equipment, for ensuring that the equipment is operated within its specifications and operating limits, and for ensuring that operators are adequately trained.

Operators use the product for its intended function. They must be trained in electrical safety procedures and proper use of the instrument. They must be protected from electric shock and contact with hazardous live circuits.

Maintenance personnel perform routine procedures on the product to keep it operating properly, for example, setting the line voltage or replacing consumable materials. Maintenance procedures are described in the manual. The procedures explicitly state if the operator may perform them. Otherwise, they should be performed only by service personnel.

Service personnel are trained to work on live circuits, and perform safe installations and repairs of products. Only properly trained service personnel may perform installation and service procedures.

Keithley products are designed for use with electrical signals that are rated Installation Category I and Installation Category II, as described in the International Electrotechnical Commission (IEC) Standard IEC 60664. Most measurement, control, and data I/O signals are Installation Category I and must not be directly connected to mains voltage or to voltage sources with high transient over-voltages. Installation Category II connections require protection for high transient over-voltages often associated with local AC mains connections. Assume all measurement, control, and data I/O connections are for connection to Category I sources unless otherwise marked or described in the Manual.

Exercise extreme caution when a shock hazard is present. Lethal voltage may be present on cable connector jacks or test fixtures. The American National Standards Institute (ANSI) states that a shock hazard exists when voltage levels greater than 30V RMS, 42.4V peak, or 60VDC are present. **A good safety practice is to expect that hazardous voltage is present in any unknown circuit before measuring.**

Operators of this product must be protected from electric shock at all times. The responsible body must ensure that operators are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product operators in these circumstances must be trained to protect themselves from the risk of electric shock. If the circuit is capable of operating at or above 1000 volts, **no conductive part of the circuit may be exposed.**

Do not connect switching cards directly to unlimited power circuits. They are intended to be used with impedance limited sources. NEVER connect switching cards directly to AC mains. When connecting sources to switching cards, install protective devices to limit fault current and voltage to the card.

Before operating an instrument, make sure the line cord is connected to a properly grounded power receptacle. Inspect the connecting cables, test leads, and jumpers for possible wear, cracks, or breaks before each use.

When installing equipment where access to the main power cord is restricted, such as rack mounting, a separate main input power disconnect device must be provided, in close proximity to the equipment and within easy reach of the operator.

For maximum safety, do not touch the product, test cables, or any other instruments while power is applied to the circuit under test. ALWAYS remove power from the entire test system and discharge any capacitors before: connecting or disconnecting ca-

bles or jumpers, installing or removing switching cards, or making internal changes, such as installing or removing jumpers.

Do not touch any object that could provide a current path to the common side of the circuit under test or power line (earth) ground. Always make measurements with dry hands while standing on a dry, insulated surface capable of withstanding the voltage being measured.

The instrument and accessories must be used in accordance with its specifications and operating instructions or the safety of the equipment may be impaired.

Do not exceed the maximum signal levels of the instruments and accessories, as defined in the specifications and operating information, and as shown on the instrument or test fixture panels, or switching card.

When fuses are used in a product, replace with same type and rating for continued protection against fire hazard.

Chassis connections must only be used as shield connections for measuring circuits, NOT as safety earth ground connections.

If you are using a test fixture, keep the lid closed while power is applied to the device under test. Safe operation requires the use of a lid interlock.

If or is present, connect it to safety earth ground using the wire recommended in the user documentation.

The symbol on an instrument indicates that the user should refer to the operating instructions located in the manual.

The symbol on an instrument shows that it can source or measure 1000 volts or more, including the combined effect of normal and common mode voltages. Use standard safety precautions to avoid personal contact with these voltages.

The **WARNING** heading in a manual explains dangers that might result in personal injury or death. Always read the associated information very carefully before performing the indicated procedure.

The **CAUTION** heading in a manual explains hazards that could damage the instrument. Such damage may invalidate the warranty.

Instrumentation and accessories shall not be connected to humans.

Before performing any maintenance, disconnect the line cord and all test cables.

To maintain protection from electric shock and fire, replacement components in mains circuits, including the power transformer, test leads, and input jacks, must be purchased from Keithley Instruments. Standard fuses, with applicable national safety approvals, may be used if the rating and type are the same. Other components that are not safety related may be purchased from other suppliers as long as they are equivalent to the original component. (Note that selected parts should be purchased only through Keithley Instruments to maintain accuracy and functionality of the product.) If you are unsure about the applicability of a replacement component, call a Keithley Instruments office for information.

To clean an instrument, use a damp cloth or mild, water based cleaner. Clean the exterior of the instrument only. Do not apply cleaner directly to the instrument or allow liquids to enter or spill on the instrument. Products that consist of a circuit board with no case or chassis (e.g., data acquisition board for installation into a computer) should never require cleaning if handled according to instructions. If the board becomes contaminated and operation is affected, the board should be returned to the factory for proper cleaning/servicing.

854x Laser Diode Mount Series Specifications

This series covers the offering of Laser Diode Mounts (LDM) for use with Continuous LIV Test Solutions. The following products: 2400-LV/2420/2440, 2500/2502, and 2510/2510AT are recommended for use with these products.

PRODUCTS

The following lists the current products in the 854x Laser Diode Mount Series.

- 8542 Dual In-Line Laser Diode Mount Bundle (includes one 8542-301A and CA-321-1A)
- 8544 Butterfly Laser Diode Mount Bundle (includes one 8542-301A and CA-321-1A)
- 8544-TEC Butterfly Laser Diode Mount Bundle (includes one 8542-301A and CA-322-1A)

ACCESSORIES

- 2400-LV/2420/2400 SourceMeter® Instruments[1]
- 2500/2502 Dual Photodiode Meter
- 2510/2510AT TEC SourceMeter® Instruments (AT: Auto Tune feature)

REFERENCED MOUNT SPECIFICATIONS

Laser Diode Package

Model	8542	8544	8544-TEC
Socket	DIL 14 pin	Butterfly 14 pin	Butterfly 14 pin
Base Plate	Position adjustable	0.1 centers	0.1 centers

Laser Temperature Control

TEMPERATURE RANGE: 0°C to +80°C

SENSOR TYPE[2] (Model 8544-TEC Only): 10 kΩ Thermistor, AD592CN

CONNECTOR/CABLE ASSEMBLY SIGNALS

Laser Diode Control 8542-301A					Single Temperature Control Cable CA-321-1A		Dual Temp. Control Cable CA-322-1A	
DB9	24x0 / 2500	Function	DB15	Wire Color	2510	Function	2- 2510s	Function
1			1	Yellow	TEC+ Out	TE HI (A)	TEC+ Out (1)	TE HI (A)
2	Triax Inner Shield [3]		2	Green	S+ Out	TE HI (A)	S+ Out (1)	TE HI (A)
3	24x0 GND Screw	Chassis GND	3	Red	TEC- Out	TE LO (A)	TEC- Out (1)	TE LO (A)
4	4 Wire Sense LO	Laser Cathode	4	Black	S- Out	TE LO (A)	S- Out (1)	TE LO (A)
5	In/Out LO	Laser Cathode	5					
6	Triax Outer Shield	PD Cathode	6					
7	Triax Signal	PD Anode	7	White Orange	F+ In, S+ In	Sensor HI (A)	F+ In, S+ In (1)	Sensor HI (A)
8	4 Wire Sense HI	Laser Anode	8	Blue Brown	F- In, S- In	Sensor LO (A)	F- In, S- In (1)	Sensor LO (A)
9	In/Out HI	Laser Anode	9	Yellow			TEC+ Out (2)	TE HI (B) [4]
			10	Green			S+ Out (2)	TE HI (B) [4]
			11	Red			TEC- Out (2)	TE LO (B) [4]
			12	Black			S- Out (2)	TE LO (B) [4]
			13					
			14	White Orange			F+ In, S+ In (2)	Sensor HI (B) [4]
			15	Blue Brown			F- In, S- In (2)	Sensor LO (B) [4]

854x Laser Diode Mount Series Specifications

GENERAL SPECIFICATIONS
RECOMMENDED MAXIMUM RATINGS[5]: Drive Current (Amps): 2 Measured Voltage (Volts): 3
WEIGHT[6]: 1.0 lbs (0.45 kg).
DIMENSIONS[6]: 1.25(32) x 3.75(95) x 5.5 (140)

Notes

1. The other SourceMeter® offerings from Keithley, 2400, 2410, 2425, and 2430 are not recommended for use with the 8542-301 and Laser Diode Mounts unless proper interlock and safety precautions are observed (esp. voltage protection).
2. The 8544-TEC unit is shipped with the 10 kΩ Thermistor wired. This is the more common requested configuration. The AD592CN sensor wires are available but not connected.
3. The Triax inner shield is available on pin 2 of 8542-301A. This will allow flexibility for the customer to exchange the wire in the LDM from pin 6 to pin 2.
4. To use the second 2510 (DB-15 pins 9-15), the customer must internally wire the 8544-TEC Mount to the DUT thermocouple. See Quick Start Guide for wiring configuration.
5. Applies Ratings based on use of Mount with provided Cables and average majority of laser diode characteristics.
6. The weight and dimension is the mounting unit without the cables.

Table of Contents

1 General Overview

General Information 1-2
- Warranty information 1-2
- Contact information 1-2
- Specifications 1-2
- Safety symbols and terms 1-2
- Inspection 1-3

Product overview 1-3
- Butterfly style mount 1-3
- Dual in-line mount 1-3
- Available models 1-3
- Configuration 1-4

2 Getting Started

Laser safety precautions 2-2
Wiring the mount (pinout configuration) 2-3
Laser diode package mounting 2-9
- 8544-TEC (only) 2-9

Connecting the Model 854x 2-10
Photodiode connection 2-12
- Unbiased internal diode connection procedure 2-12
- Biased internal diode connection procedure 2-12
- Unbiased, low noise internal diode connection procedure 2-13

TEC cooled devices 2-13
- Externally cooled device connection 2-14
- External and Internally cooled device connection 2-14

Autotuning 2-14
Programming example: Model 2510 TEC SourceMeter 2-16

List of Illustrations

2 Getting Started

Figure 2-1 Removing the bottom plate 2-4
Figure 2-2 Configuring pinouts 854x series (not 8544-TEC) 2-5
Figure 2-3 Configuring pinouts on 8544-TEC 2-6
Figure 2-4 Cable pinouts 2-8
Figure 2-5 Laser diode package mounting 2-9
Figure 2-6 Connecting the Model 854x 2-11

List of Tables

2 Getting Started

Table 2-1 Model 8544-TEC DB-15 Wiring Chart —Pre-wired 2-7
Table 2-2 Model 8544-TEC DB-15 Wiring Chart —Optional 2-7
Table 2-3 Internal TEC Specifications (8544-TEC) 2-14
Table 2-4 Programming example 2-15

1
General Overview

General Information

Warranty information

Warranty information is located at the front of this guide. Should your Model 854x Series Laser Diode Mount require warranty service, contact the Keithley representative or authorized repair facility in your area for further information. When returning the unit for repair, be sure to fill out and include the service form at the back of this guide to provide the repair facility with the necessary information.

Contact information

Worldwide phone numbers are listed at the back of this guide. If you have any questions, please contact your local Keithley representative or call one of our application engineers at 1-800-348-3735 (U.S. and Canada only). Check www.keithley.com for additional information.

Specifications

NOTE *Specifications are subject to change without notice.*

Model 854x Series Laser Diode Mount specifications shown at the front of this guide were current at the time of duplication, but they are subject to change without notice. For the most recent specifications, refer to the web site at www.keithley.com.

Safety symbols and terms

The following symbols and terms may be found on an instrument or used in this guide.

If or is present, connect it to safety earth ground using the wire recommended in the user documentation.

The symbol on an instrument indicates that the user should refer to the operating instructions located in the manual.

The symbol on an instrument shows that it can source or measure 1000 volts or more, including the combined effect of normal and common mode voltages. Use standard safety precautions to avoid personal contact with these voltages.

The **WARNING** heading used in this guide explains dangers that might result in personal injury or death. Always read the associated information very carefully before performing the indicated procedure.

The **CAUTION** heading used in this guide explains hazards that could damage the instrument. Such damage may invalidate the warranty.

Inspection

The Model 854x Series Laser Diode Mount (LDM) was carefully inspected before shipment. After unpacking all items from the shipping carton, check for any obvious signs of physical damage that may have occurred during transit. Report any damage to the shipping agent immediately. Save the original packing carton for possible future shipment. The following items are included with every Model 854x Laser Mount order:

- Model 854x Laser Mount.
- Product Information CD-ROM that contains a PDF of this Quick Start Guide.
- LIV cable (8542-301)—use with the 2400-LV, 2420, 2440, and 2500 (all 854x series models)
- Temperature control cables (models CA-321 and CA-322)—use with the 2510. Use the single cable (CA-321) with the 8542 and 8544, and the dual cable (CA-322) with the 8544-TEC.

Product overview

WARNING **It is not recommended that the cable and mount be used with the following Keithley source products: Models 2400, 2410, 2425, and 2430. These products can output hazardous voltages.**

Model 854x LDMs are specifically designed to provide for temperature and LIV (Light Intensity-Current-Voltage) testing on a Laser Diode package (DUT not included). Both butterfly and dual in-line style mounts are available.

Butterfly mount

- 14-pin swing latch flatpack test socket and mounting baseplate
- 0.1" pin centers

Dual in-line mount

- 14-pin zero insertion force socket
- adjustable baseplate

Available models

See the product specifications for product list and key characteristics.

Configuration

The DB-9 and DB-15 connections are manually configured by changing pigtail connections on the internal screw terminal strips. Refer to Section 2 for detailed information.

2

Getting Started

Laser safety precautions

WARNING **Model 854x Laser Diode Mounts do not contain a laser but are designed to be used with laser diode devices. Use the following safety practices to protect operators and other users of this product from potential exposure to laser radiation:**

- **Protect operators from radiation and electrical hazards at all times.**
- **Make sure the installer complies with all applicable laws and regulations on laser safety including, but not limited to, warning signs and operator training.**
- **Use test fixtures with an interlock that disables the circuit (source outputs inhibited) when the operator can be exposed to radiation. Do not defeat the interlock under any operating conditions.**
- **Provide service personnel proper protection equipment (e.g., laser safety goggles) when servicing the test system.**
- **Make sure the customer's laser safety officer (LSO) reviews and approves all installations before the installation is put into operation. Report all safety issues to the customer's LSO immediately.**
- **Do not leave any connections exposed when making connections. Be sure that all external circuits are properly insulated.**

Operate instruments in a safe manner. Follow all applicable safety regulations for installing, configuring, and using the Keithley Models 2400-LV, 2420, 2440, 2500, 2502, 2510, and 2510-AT. Each model, as installed, should be approved by the appropriate safety personnel, such as the responsible Laser Safety Officer or equivalent. Suggested starting points for workplace regulations and standards: ANSI Z136.1, IEC 825, OSHA 29 CFR 1910.

Be aware of workplace hazards, strive to minimize them, and work safely.

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Wiring the mount (pinout configuration)

The wiring to the laser diode is user configurable. This provides flexibility to accommodate various pinout configurations. Use the following procedure to configure the wiring. Also refer to Figures 2-1, 2-2, 2-4, and the associated tables contained in the specifications located at the beginning of this manual.

1. Remove power from the device.
2. Unscrew the four screws on the bottom of the mount (Figure 2-1) to remove the bottom plate and allow access to the wires and terminal strip (Figures 2-2 and 2-3).
3. Configure the mounts wiring as desired.
   - For identification of the specific laser mount pinouts, refer to the specific type of laser diode package (either dual-inline or butterfly) in Figure 2-1.
   - For wire identification, refer to the pinouts and pigtail color codes for the DB-9 and DB-15 connectors (Figures 2-2 and 2-3). A guide is also contained on the printed circuit board.
   - Cable pinouts are shown in Figure 2-4. For wire color, use, and function information, refer to the specifications shown at the front of this guide.
   - To remove a pigtail from a connector, loosen the applicable screw terminal and remove the wire.
   - To attach a pigtail to a connector, determine the terminal number, loosen the applicable screw terminal (if needed), insert the wire, and secure with the screw.
   - Make sure all connections are secure.
4. Attach the bottom plate of the mount securing with the four screws removed in step 2.

Figure 2-1
Removing the bottom plate

NOTE: *Laser diode packages are not included with Model 854x mounts.*

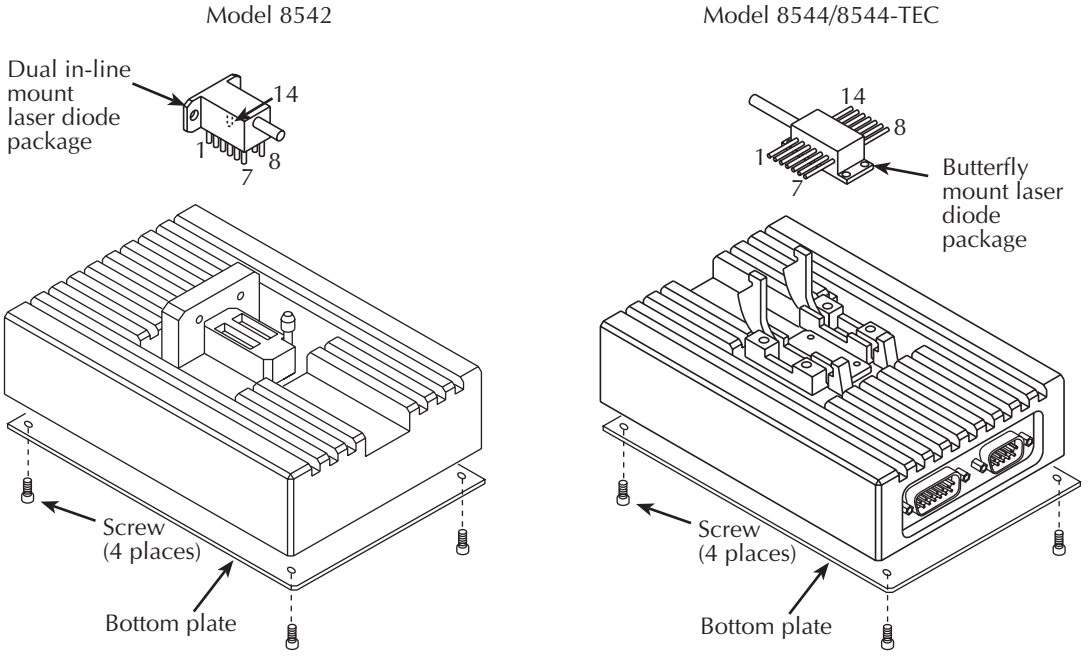


Figure 2-2
Configuring pinouts 854x series (not 8544-TEC)

Model 854X

Laser diode driver connection

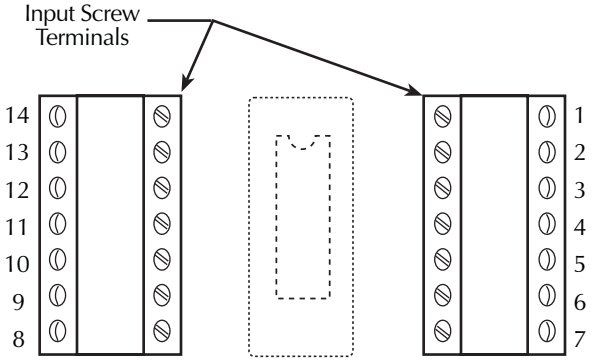
DB-9 Connector

DB-9 Pin #	Pigtail Color	Function
3	Brown	Chassis GND
4,5	Black	Laser Cathode
6	White	PD Cathode (-)
7	Green	PD Anode (+)
8,9	Red	Laser Anode

Temperature controller connection

DB-15 Connector

DB-15 Pin #	Pigtail Color	Function
1,2	Orange	TE (+)
3,4	Grey	TE (-)
7	Violet	Sensor (+)
8	Blue	Sensor (-)



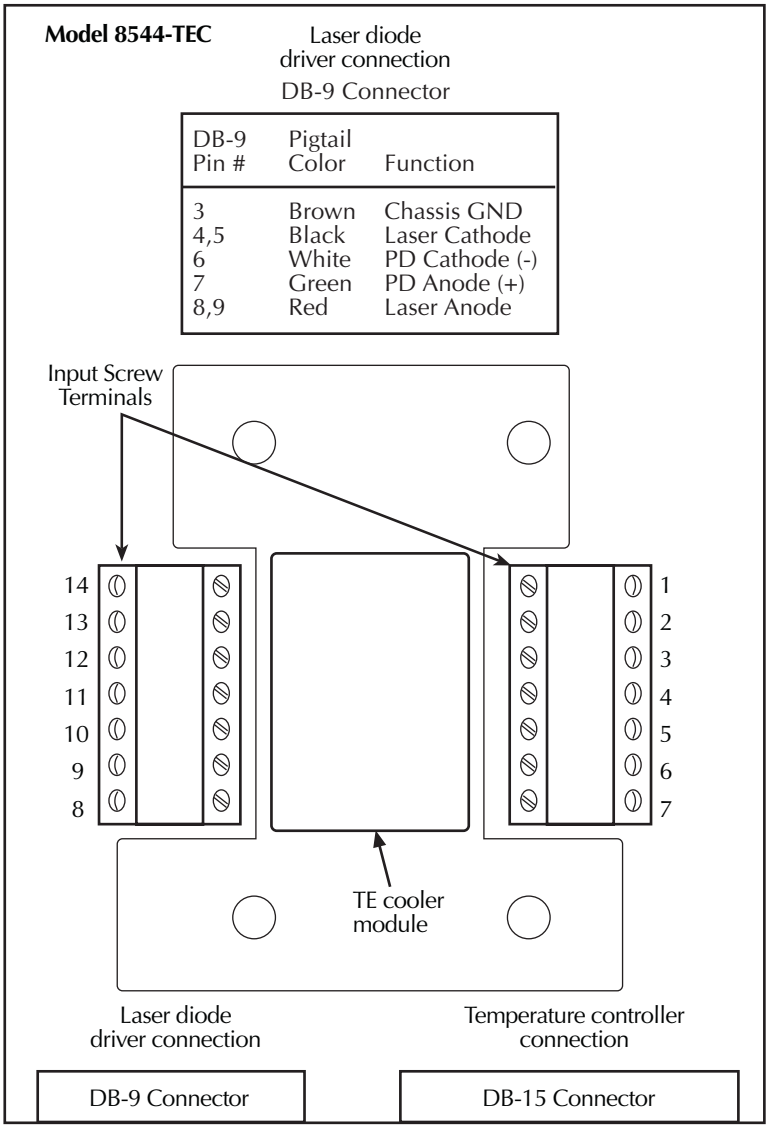
Laser diode driver connection

DB-9 Connector

Temperature controller connection

DB-15 Connector

Figure 2-3
Configuring pinouts on 8544-TEC


Model 8544-TEC
Laser diode driver connection
DB-9 Connector
DB-9 Pin # | Pigtail Color | Function
3 | Brown | Chassis GND
4,5 | Black | Laser Cathode
6 | White | PD Cathode (-)
7 | Green | PD Anode (+)
8,9 | Red | Laser Anode
Input Screw Terminals
14 13 12 11 10 9 8
1 2 3 4 5 6 7
TE cooler module
Laser diode driver connection
Temperature controller connection
DB-9 Connector
DB-15 Connector

NOTE The 8544-TEC Fixture also comes with an Analog devices AD592CN temperature sensor installed but not connected.

NOTE Refer to Tables 2-1 and 2-2 for wiring charts.

Table 2-1
Model 8544-TEC DB-15 wiring chart (pre-wired)

NOTE *This table contains the default connections.*

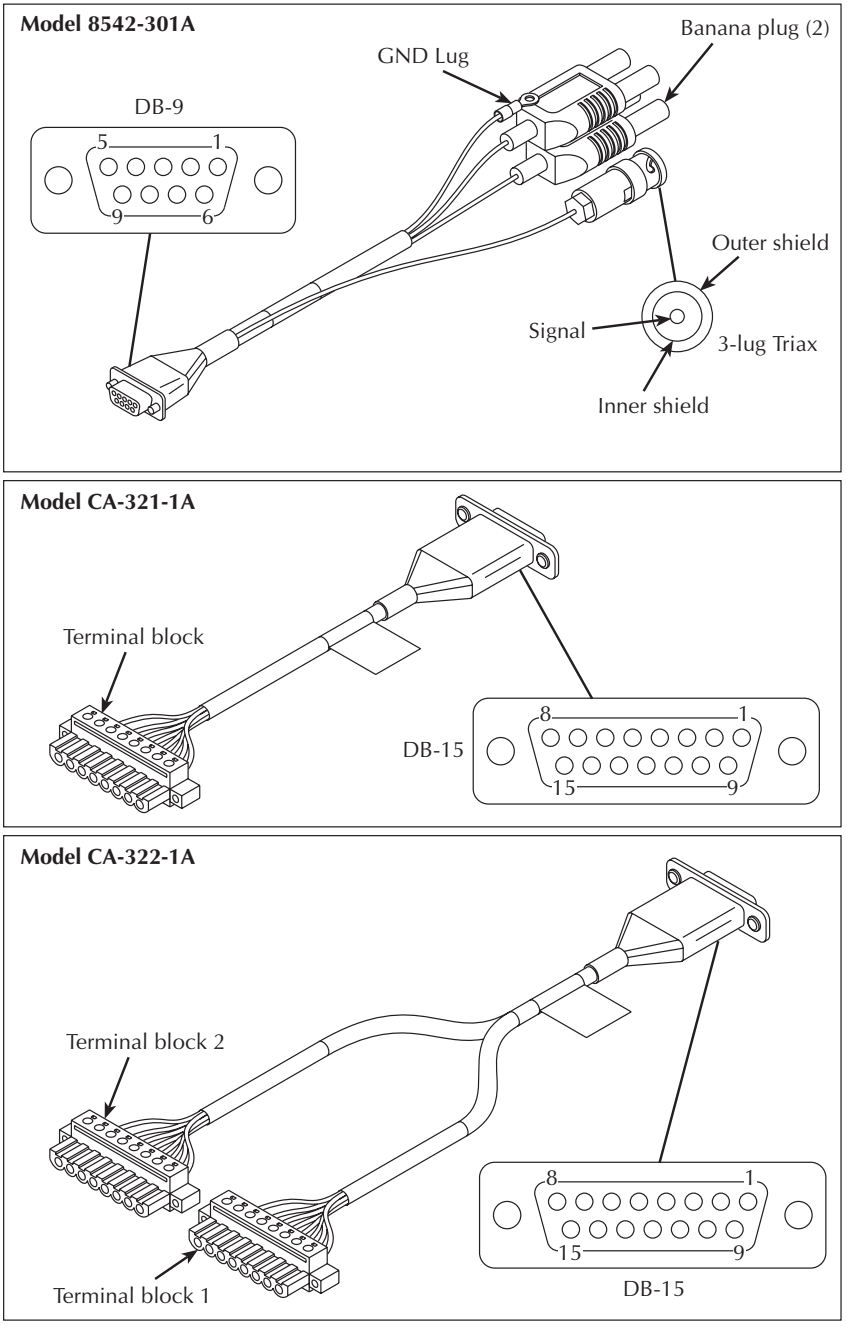
DB-15 Pin Number	Function
1,2	Fixture TE (+)
3,4	Fixture TE (-)
7	Fixture sensor (+) (10K Thermistor Default)
8	Fixture sensor (-) (10K Thermistor Default)

Table 2-2
Model 8544-TEC DB-15 wiring chart (optional)

NOTE *This table contains the connections required for fixture and internal DUT TEC control (Cable CA-322-*).*

DB-15 pin number	Function
9 and 10	DUT TE (+)
11 and 12	DUT TE (-)
14	DUT sensor (+)
15	DUT sensor (-)

Figure 2-4
Cable pinouts

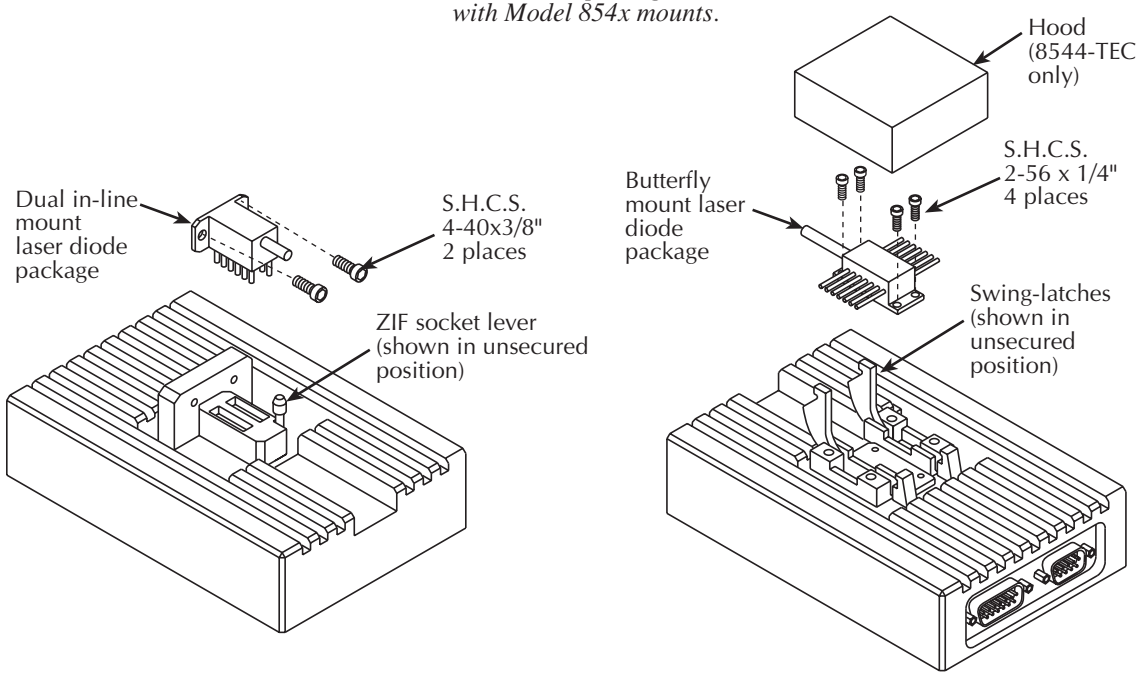


Laser diode package mounting

Place the laser diode package in the connector (see Figure 2-5). After securing it with the swing-latches or ZIF socket lever, fasten it to the block with hardware.

Figure 2-5
Laser diode package mounting

NOTE Laser diode packages are not included with Model 854x mounts.


Dual in-line mount laser diode package
S.H.C.S. 4-40x3/8" 2 places
ZIF socket lever (shown in unsecured position)
Hood (8544-TEC only)
S.H.C.S. 2-56 x 1/4" 4 places
Butterfly mount laser diode package
Swing-latches (shown in unsecured position)

Model 8542

Model 8544 and Model 8544-TEC

8544-TEC (only)

After the package is properly mounted, install the aluminum 2x2x1" black hood. This isolates and stabilizes the laser diode package temperature from external ambient changes.

Connecting the Model 854x

Using Figure 2-6 as a guide, make electrical connections as desired. Use the following procedure as a guide.

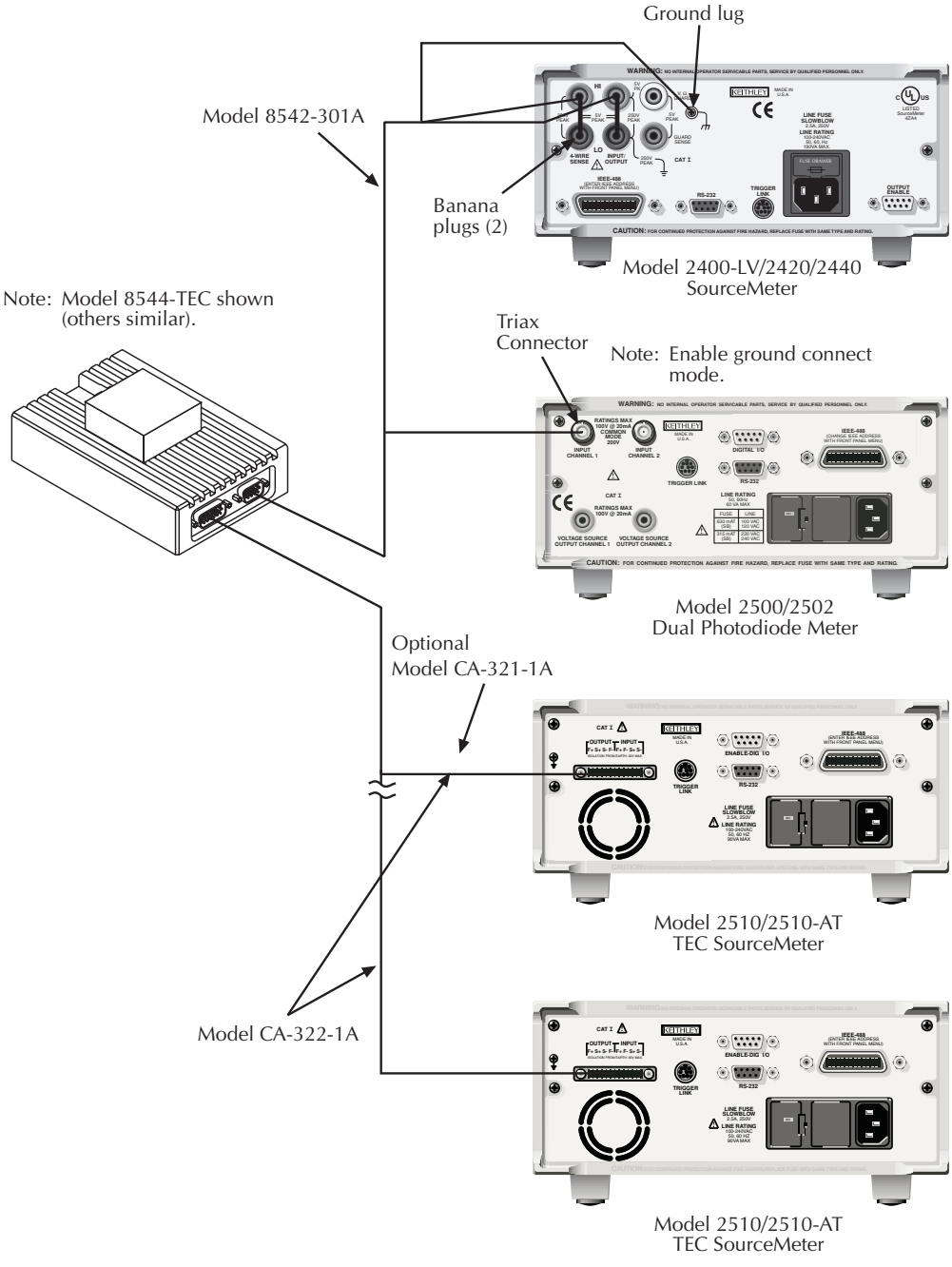
1. Connect 8542-301 cable (DB-9).
   - Connect the DB-9 end of the cable to the 854x's DB9 connector.
   - Connect the banana plugs to the Input/Output and 4-Wire Sense of the 24×0.
   - Connect the triax connector to either Input Channel of the 2500.
   - Connect the ground lug to the ground screw of the 24x0 back panel.
2. Connect the CA-321 / CA-322 cable (DB-15).

NOTE *Use cables 8542-301 and CA-322 with the Model 8544-TEC mount. Use cables 8542-301 and CA-321 with all other 854x series mounts.*

- Connect the DB-15 connector end of the CA-321 cable to the 8542 or 8544 DB-15 connector. (Connect the DB-15 connector end of the CA-322 if using the 8544-TEC.)
- Connect the 8-pin terminal block end of the CA-321 / CA-322 cable to the 2510 Input/Output Connector.

WARNING **It is not recommended that the Model 854x series mounts/cables be used with the following Keithley source products: Models 2400, 2410, 2425, and 2430. These products can output hazardous voltages.**

Figure 2-6
Connecting the Model 854x



Photodiode connection

The 854x series of laser diode fixtures utilize a connection for monitoring internal photodiodes (rear facet) with the Keithley Model 2500/2502 Dual Photodiode Meter. The standard wiring configuration of the 854x series allows the user to operate the internal photodiode in a biased or unbiased state.

Unbiased internal diode connection procedure

NOTE *This procedure uses the default standard wiring configuration of the 854x series—the bottom does not have to be removed and configuration changed unless it has been changed from the default configuration.*

1. Connect cable, instruments, and DUT to the Model 854x (see Connecting the Model 854x on page page 2-10).
2. Enable ground connect on the Model 2500/2502.
   - From the front panel, press CONFIG>SRC <n> where n is 1 or 2 > ENABLE.
   - Remotely, send :SOUR1:GCON ON for channel 1, :SOUR2:GCON ON for channel 2.
3. Set the source voltage to 0V.

Biased internal diode connection procedure

NOTE *This procedure uses the default standard wiring configuration of the 854x series. The bottom does not have to be removed and configuration changed unless it has been changed from the default configuration.*

1. Connect cable, instruments, and DUT to the 854x (see Connecting the Model 854x on page page 2-10).
2. Enable ground connect on the Model 2500/2502.
   - From the front panel, press CONFIG>SRC <n> where n is 1 or 2 > ENABLE.
   - Remotely, send :SOUR1:GCON ON for channel 1, :SOUR2:GCON ON for channel 2.
3. Set the source voltage to desired bias value for detector.

Unbiased, low noise internal diode connection procedure

This technique will provide the lowest noise measurements by eliminating ground loops between the instrument and the fixture, but disables the ability to bias the internal diode. See the Keithley 2500/2502 User's Manual (Section 3) on the Product Information CD included with your shipment for more details.

NOTE *This procedure uses a specific wiring configuration of the 854x series. Remove the bottom plate and change the wiring configuration as detailed in the procedure.*

1. Open the bottom cover of the 854x fixture.
2. De-solder the wire connected to PIN 6 on the DB-9 input connector. See Wiring the mount (pinout configuration) on page 2-3 for internal wiring connections of the 854x fixture.
3. Re-attach wire previously connected to PIN 6 to PIN 2 on the DB-9 input connector.
4. Replace and secure the bottom cover of the 854x fixture.
5. Connect cable, instruments, and DUT to the 854x (see Connecting the Model 854x on page 2-10).
6. Disable ground connect on the Model 2500/2502.
   - From the front panel, press CONFIG>SRC <n> where n is 1 or 2 > DISABLE.
   - Remotely, send :SOUR1:GCON ON for channel 1, :SOUR2:GCON ON for channel 2.
7. Set the source voltage to 0V. This connection scheme does not allow for detector bias.

NOTE *Photodiodes can be damaged by excess bias voltages in both the positive and reverse direction. This guide assumes that the diode was oriented such that a positive bias voltage from the Model 2500/2502 would reverse bias the diode. Always double-check your wiring and connections to avoid damaging the device.*

TEC cooled devices

Many packaged laser diodes have TEC (Peltier) temperature control. During laser operation, the TEC is used to maintain the diode at a user specified temperature. The Keithley 854x series of laser diode fixtures and cables are designed to work in conjunction with the Keithley Model 2510 and 2510-AT TEC Sourcemeter Instruments to provide an accurate and stable temperature control unit for cooled devices.

The Keithley 8544-TEC has an additional TEC located internal to the fixture. It can be used to control the "environmental" temperature of packaged devices with internal cooling or to temperature control uncooled devices.

Table 2-3
Internal TEC Specifications (8544-TEC)

Specification	Value/Range
Temperature range	0–80°C
TEC Power	16 Watts
TEC Maximum Voltage/Current	7.6V at 3.9A

Externally cooled device connection

NOTE *This configuration uses a single Model 2510.*

This is the default wiring for the 8544-TEC Fixture. It utilizes the TEC and temperature sensor of the 8544-TEC fixture. See Figure 2-3 and Table 2-1 for details. The following are the A, B, and C coefficients for a 10K thermistor:

$A = 1.129241 \times 10^{-3}$
$B = 2.341077 \times 10^{-4}$
$C = 0.877547 \times 10^{-7}$

External and Internally cooled device connection

NOTE *This configuration uses dual Model 2510s.*

This configuration uses two Model 2510s (2510-AT) and a cable (CA-322-*) to actively control the temperature of the DUT using its internal TEC as well as the fixture TEC.

This configuration will require additional wiring by the user. See Figure 2-3 and Table 2-2 for details.

Autotuning

The Keithley Model 2510 series of TEC controllers utilize a Proportional, Integral, and Derivative (PID) algorithm to optimize settling time and stability. In the past, the P, I, and D values had to be determined in a time consuming manual method of trial and error. The Keithley Model 2510-AT Autotuning TEC Sourcemeter accelerates test setup and temperature control optimization. This is accomplished by automatically determining the PID coefficients for a particular thermal load. The following two sets of coefficients are returned to the Model 2510-AT:

- coefficients optimized for minimum settling time
- coefficients optimized minimum overshoot

Use GPIB to control autotuning (front panel control is not available).

For more details on the Keithley Model 2510/2510-AT and Autotuning, refer to the Model 2510/2510-AT User's Manual and the Keithley Applications Note "Optimizing TEC PID Coefficients Automatically with the Model 2510-AT Autotuning TEC SourceMeter® Instrument". Both of these are PDFs on the product information CD-ROM received with your shipment.

NOTE *Additional information is also available on the web at www.keithley.com.*

Programming example: Model 2510 TEC SourceMeter

The code fragment contained in Table 2-4 is a subroutine that conditionally sets up the following Model 2510 operating modes:

- Current protection limit: 1A
- Sensor type: thermistor
- Thermistor sensor current range: auto
- Thermistor sensor measurement range: 10 k
- Temperature setpoint: set during program execution

Table 2-4
Programming example

Model 2510 TEC SourceMeter

```
Private Sub comboTempOnOff_Click()
    If comboTempOnOff.Text = "ON" Then
        Call send(intKth2510, "*rst", intStatus)
        Call send(intKth2510, ":sens:curr:prot:lev 1.0", intStatus) ' 1A current limit
        Call send(intKth2510, ":sens:temp:tran ther", intStatus) ' Thermistor sensor type
        Call send(intKth2510, ":sens:temp:curr:auto on", intStatus) ' Auto sensor current range
        Call send(intKth2510, ":sens:temp:ther:range 1e4", intStatus) ' 10k ohm sensor resistance range
        Call send(intKth2510, ":sour:temp:spo " & comboTempSetPoint.Text, intStatus) ' Program setpoint
        Call send(intKth2510, ":outp on", intStatus) ' Turn on output
        Call send(intKth2510, ":meas:res:ac?", intStatus) ' Get TEC AC resistance
        Call enter(strData, 100, intLength, intKth2510, intStatus)
        txtTECRes.Text = strData
        Call send(intKth2510, ":outp on", intStatus)
    Else
        Call send(intKth2510, "*rst", intStatus)
    End If
End Sub
```

Service Form

Model No. _____ Serial No. _____ Date _____

Name and Telephone No. _____

Company _____

List all control settings, describe problem and check boxes that apply to problem. _____

_____

_____

❑ Intermittent ❑ Analog output follows display ❑ Particular range or function bad; specify

_____

❑ IEEE failure ❑ Obvious problem on power-up ❑ Batteries and fuses are OK

❑ Front panel operational ❑ All ranges or functions are bad ❑ Checked all cables

Display or output (check one)

❑ Drifts ❑ Unable to zero ❑ Unstable

❑ Overload ❑ Will not read applied input

❑ Calibration only ❑ Certificate of calibration required ❑ Data required

(attach any additional sheets as necessary)

Show a block diagram of your measurement including all instruments connected (whether power is turned on or not). Also, describe signal source.

Where is the measurement being performed? (factory, controlled laboratory, out-of-doors, etc.)_____

_____

What power line voltage is used? _____ Ambient temperature? _____ °F

Relative humidity? _____ Other? _____

Any additional information. (If special modifications have been made by the user, please describe.)

_____

_____

Be sure to include your name and phone number on this service form.

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